ICYNENE™
HEALTHIER, QUIETER, MORE ENERGY EFFICIENT®

THE ICYNENE® ADVANTAGE

BUILT GREEN WITH A PINK RIBBON:

Build for the Cure Show Home Features Performance & Sustainability

Synopsis:

- ✓ ICYNENE LD-R-50™† participation helped to raise funds for the Susan G. Komen Fund, Charlotte Affiliate
- ✓ Integrated renewable-based insulation and air barrier for a healthier home
- ✓ Estimated to reduce energy consumption by 62% for heating and 40% for cooling compared to the same house insulated with conventional, air-permeable insulation
- ✓ Helped save energy to reduce CO_2 emissions
- ✓ Created an unvented attic to reduce humidity and improve energy performance in a hot/humid climate
- ✓ Minimized air leakage to provide a comfortable play room over the garage, minimizing the entry of harmful fumes such as carbon monoxide

Overview: A Grand Home with Purpose

This 5,700 square foot, Southern Traditional home was an attraction for many reasons. Not only did it incorporate next generation products that made it healthier and more energy efficient, it was also a show home to help raise funds and awareness for the Susan G. Komen Fund, the largest grassroots initiative for finding a cure for breast cancer. All proceeds raised from the scheduled special events, workshops, and tours benefitted the local affiliate of Susan G. Komen for the Cure.

Built by E.S. Johnson Builders, the *Build for the Cure* show home is located minutes from downtown Charlotte in the Springfield Community of Ft. Mill, South Carolina. Surrounded by 2.2 acres of lush green golf course, open space, walking trails and parks, E.S. Johnson Builders turned to green building products that would help preserve this eco-conscious landscape.

The building experience of this custom-built home was taped by *For Your Home*, a home and garden television show. Airing nationally across PBS stations in the spring 2010, viewers can watch this project take shape during 13 episodes.

The home is surrounded by trails, parks, and open space. ICYNENE LD-R-50™ renewable spray foam helped preserve this eco-conscious landscape.

The Build for the Cure *home helped raise funds and awareness for breast cancer research.*

The Challenge: Building Green while Building Awareness

The product selection process considered E.S. Johnson's Green Building Initiative. The goal of this initiative was to educate homeowners and buyers about the options available in the marketplace that can make a significant contribution to energy-efficient and healthy living. Without sacrificing the builder's reputation for craftsmanship and quality, the products must work together as a system to deliver both performance and sustainability.

Another major challenge was addressing potential airborne moisture problems. Many homes built with a vented attic in the Southeastern United States suffer from poor moisture management. The outside air is hot and carries humidity. When this air is allowed into the attic, it can migrate toward the ceilings of the air-conditioned rooms and create moisture-related problems such as mold. To quote Dr. Joe Lstiburek's *Top Ten List of Dumb Things to do in the South*, before the airborne moisture even gets to the ceiling of these conditioned rooms "*it will see those cold R-6 insulated ducts, fittings, etc. and drip all over.*"[1]

More efficient operation of the attic-located air conditioning equipment was also a top consideration. Vented attic spaces can result in excessive energy consumption and high energy bills due to inefficient operation of the HVAC system.

Finally, a crawlspace can be a difficult area to insulate. Typically very humid, it was important to seal the space above from the entry of this hot, humid air. Since up to 99% of moisture travels through the air, reducing airflow (convection) was a critical consideration. An all-in-one insulation and air barrier can help reduce the entry of moisture and other potential irritants that can originate from a crawlspace.

The Solution: High-performance & Eco-conscious

With sustainability in mind, the builder sought products that would help save energy, reduce operating costs and mitigate CO_2 emissions. E.S. Johnson Builders selected ICYNENE LD-R-50™, a key component to sustainable building due to the product's insulating and air-sealing capabilities. ICYNENE LD-R-50™ is also responsibly made using castor oil.

Icynene Licensed Dealer, Carolina Foam Solutions, professionally installed this renewable-based insulation and air barrier to address the following problem areas:

- To protect the home from a major source of energy loss – air leakage, R-13 was installed in the exterior walls and rim joists.
- To increase efficiency and minimize airborne moisture-related problems, R-21 was installed on the underside of the roof deck and walls of the attic, converting it into an unvented space.
- For thermal performance and maximum indoor air quality, R-21 was installed in the floor of the living space above the garage.
- To achieve superior performance in a crawlspace application, R-21 was installed on the underside of the floor above the crawlspace.

ICYNENE LD-R-50™ combines proven performance and an eco-conscious alternative to help minimize environmental impact while reducing energy consumption and related greenhouse gas emissions. For this homeowner, saving energy never felt so good.

The Result: Traditional Style Embraces Next Generation Features

ICYNENE LD-R-50™ is 100% water-blown and does not contain HFCs or PBDEs (poly-brominated diphenyl ethers). It is also a Low-Emitting Material (CHPS EQ 2.2 Section 01350 Compliant), earning its status as an Environmentally Preferable Product (EPP).[2] ICYNENE LD-R-50™ is free from long-term emissions.

Here's a look at some of the house features made possible with ICYNENE LD-R-50™:

Bonus Room over the Garage

E.S. Johnson Builders utilized the space over the garage to create a children's play room. While bonus rooms offer great functional space, they can often be uncomfortable if not insulated and air-sealed properly. It's almost impossible to keep conventional fibrous insulation in constant contact with the garage ceiling. Due to voids and air spaces, fibrous insulation may not perform to its rated R-value. Gaps in the insulation allow exterior air, exhaust fumes and odors to penetrate from the garage or exterior. To address this problem and provide a safe and comfortable play area, Carolina Foam Solutions insulated and air-sealed the garage ceiling (underside of the bonus room's subfloor) with ICYNENE LD-R-50™ to minimize air leakage, potential condensation problems, and air quality issues.

Responsibly made using castor oil, ICYNENE LD-R-50™ exceeds the minimum renewable requirement for a biobased material.

ICYNENE LD-R-50™ helped minimize environmental impact while reducing energy consumption and related greenhouse gas emissions.

Unvented attic

The *Build for the Cure* project home features an unvented/indirectly conditioned attic, facilitated by the air-sealing capabilities of ICYNENE LD-R-50™. A key benefit of this design is its effectiveness in reducing exterior humidity from the attic. ICYNENE LD-R-50™ will help keep the attic drier by sealing that airborne moisture out.

Of equal importance was the energy efficiency that can be attained with an unvented attic. Because the heating and cooling equipment is situated in the attic of the *Build for the Cure* home, creating an unvented attic design was a major way for E.S. Johnson to deliver significant energy savings. Research suggests that duct leakage can waste more than 30% of household heating and cooling energy.[3] By air-sealing the underside of the roof deck and attic walls (including the soffit vents) with an air-impermeable insulation like ICYNENE LD-R-50™, duct leakage (and energy dollars) is contained within the building envelope rather than venting to the outside. Research by Building America shows that unvented attic spaces result in energy savings of as much as 50%.[4] This is also due to the fact that the HVAC system can now operate at a much less stressful temperature, around 3% to 5% of the indoor set point[5], instead of the typical attic temperatures.

Some additional benefits of installing ICYNENE LD-R-50™ to create an unvented attic design:

- material will dry in the event of a roof leak
- more comfortable attic temperatures
- minimizes moisture ingress from wind-driven rain
- contributes toward potential reduction in HVAC equipment sizing

Energy Efficiency and Reduced Emissions

A comparison using REM/Design Residential Energy Analysis Software reveals that the *Build for the Cure* home costs 62% less to heat and 40% less to cool than if it had been insulated with an air-permeable insulation such as fiberglass.

	Fiberglass Home	Icynene Home	Difference ($)	Difference (%)
Heating	$1,759	$662	$1,098	62.4%
Cooling	$ 812	$485	$ 328	40.3%

The Build for the Cure *home reduced heating and cooling costs by 62% and 40% respectively.*

Duct leakage can waste more than 30% of heating and cooling energy. Creating an unvented attic with LD-R-50™ helped contain this leakage within the home to save energy and money.

Using ICYNENE LD-R-50™ in place of air-permeable insulation has dramatically reduced this home's carbon footprint. In fact, a 62% reduction in heating energy use translates to the equivalent percentage reduction in carbon dioxide (CO_2) emissions. Similarly, by reducing cooling energy use by 40%, CO_2 emissions are also reduced by the same amount. Therefore, the Icynene-insulated *Build for the Cure* home is projected to produce **7,899 lbs. less** carbon dioxide (CO_2) emissions during the heating season and **4,231 lbs. less** during the cooling season.

Crawlspace Application

ICYNENE LD-R-50™ ensured coverage that was continuous and complete. ICYNENE LD-R-50™ sprays on as a liquid and then expands to 100 times its initial volume, enabling Carolina Foam Solutions to seal all gaps and cracks in the ceiling of the crawlspace for a continuous air barrier. This application dramatically reduced convective heat and moisture flow, which was critical to achieving a high-performance crawlspace. In addition to improving indoor air quality in the area above the crawlspace, ICYNENE LD-R-50™ helped minimize potential moisture build-up and related damage that can occur, such as buckling hardwood floors that may be situated in the room above or even musty odors.

Meeting Air Barrier Requirements

Minimizing air infiltration for this size project was a challenging – but achievable – task for Icynene Dealer, Carolina Foam Solutions. Sealing air leaks was critical to addressing airborne moisture problems and optimizing energy efficiency. In particular, Carolina Foam needed to pay special attention to the Code requirements for the unvented spaces. The crawlspace under the porch needed an air barrier and the unvented attic required the use of an air-impermeable insulation (as tested by ASTM E 283).[6] As an all in one insulation and air barrier material, ICYNENE LD-R-50™ was the best solution. In one step and using less sealing material, Carolina Foam helped E.S. Johnson Builders deliver superior airtightness to create a Healthier, Quieter, More Energy Efficient® living environment.

ICYNENE LD-R-50™ brings to this project these added environmental benefits:

- ✓ For every kilogram (2.2 lbs) of castor oil produced in place of petroleum-based polyol, there is a reduction of nearly 3.5 kilograms (7.7 lbs) of Carbon Dioxide (CO_2) to the atmosphere.[7]
- ✓ Castor oil is 100% naturally filtered, with no chemical additives required.[8]
- ✓ The production process of the castor oil has low energy dependence, consisting simply of de-husking and pressing. Harvesting can be done manually.
- ✓ Castor crops are non-irrigated (relying only on natural rainfall), saving scarce water supplies.
- ✓ Castor crops do not require treatment with pesticides or fungicides.
- ✓ A cradle-to-gate study commissioned by the Department of Energy (DOE) reported that there are essentially zero net greenhouse gas emissions from the production of the castor oil.
- ✓ ICYNENE LD-R-50™ exceeds the minimum renewable requirement for a bio-based material (testing in accordance with ASTM D 6866) and can contribute toward a building's achievement of credits/points under various national green building standards, including LEED-H, LEED-NC, and the ICC 700-2008 National Green Building Standard.

Icynene Insulation

Icynene foam insulation products are sprayed into/onto walls, crawlspaces, underside of roofs, attics and ceilings by Icynene Licensed Dealers. They expand in seconds to create superior insulating and air-sealing results. Every crevice, crack, electrical box, duct and exterior penetration is effortlessly sealed to reduce energy-robbing random air leakage. Icynene products adhere to the construction material and remain flexible so that the integrity of the building envelope seal remains intact over time.

Icynene is ideal for residential, commercial, industrial and institutional indoor applications. The products are:

Healthier: Icynene spray foam products are CHPS (Collaborative for High Performance Schools) EQ 2.2 Section 01350 Compliant, meeting nationally recognized requirements as Low-Emitting Materials (LEM) and Environmentally Preferable Products (EPP). Icynene spray foam products are 100% water-blown and contain no HFCs or PBDEs. Icynene seals out dust, pollen and other allergens from entering the structure. As air barriers, Icynene products minimize the potential for airborne moisture build-up and related problems such as mold and mildew.

Quieter: By air-sealing the building envelope, Icynene effectively minimizes airborne sounds. Icynene is perfect for reducing unwanted noises from home theaters, plumbing runs and playrooms.

More Energy Efficient: Icynene delivers up to 50% more energy savings versus traditional insulation.

Information about Icynene insulation can be obtained by calling Icynene Inc. (800-758-7325), visiting the website Icynene.com, or contacting your local Icynene Licensed Dealer.

Endnotes:

1. *http://www.eeba.org/resources/dumbsouth/index.html, Joe's Top Ten List of Dumb Things to do in the South by Joe Lstiburek, Building Science Corporation*
2. *California High Performance Schools (CHPS) E.Q. 2.2/Section 01350 Compliant*
3. *Duct Diligence, p.2, Green Builder magazine, February 2009*
4. *ibid*
5. *Unvented Roof Construction, by Ken Czarnomski, Department Chair for Construction Management Technologies (a part of A-B Tech Construction Science) at Asheville Buncombe Technical College; http://abtechconstructionscience.com/about-green-building/high-efficiency-technologies.html*
6. *International Residential Code Section 806.4, 2007*
7. *Castor oil supplier*
8. *ibid*

† The Icynene product installed and addressed in this project example is Icynene's renewable formula, ICYNENE LD-R-50™.

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For more information, contact your local Icynene Licensed Dealer

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